

The listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

1. (Previously Presented) A microfluidic structure comprising:  
a plurality of diaphragm valves that control fluid flow along each of a plurality of fluidic channels, said fluidic channels each comprising a discontinuity and wherein the microfluidic structure comprises an elastomer membrane sandwiched between a pneumatic layer and a fluidic layer, wherein:  
the pneumatic layer comprises a first surface including at least one pneumatic channel facing the membrane and valve areas aligned with said fluidic channel discontinuities;  
the fluidic layer comprises a second surface including the plurality of fluidic channels facing the membrane;  
the elastomeric membrane normally prevents fluid flow across the fluidic channel discontinuities;  
and  
a vacuum to the at least one pneumatic channel causes the membrane to deflect to allow a flow of a fluid across the fluidic channel discontinuities, thereby forming the plurality of diaphragm valves.
2. (Previously Presented) The microfluidic structure of claim 1, wherein the first and second layers are glass.
3. (Original) The microfluidic structure of claim 1, wherein the membrane is gas permeable.
4. (Previously Presented) The microfluidic structure of claim 1, further comprising additional surfaces and membranes in fluidic communication with the microfluidic structure through a plurality of vias.
5. (Original) The microfluidic structure of claim 4, wherein the additional surfaces have additional channels to provide paths for fluid flow.

6. (Previously Presented) The microfluidic structure of claim 1, wherein the fluidic layer includes a plurality of vias operable to provide paths for fluid flow through the fluidic layer.

7. (Previously Presented) The microfluidic structure of claim 1 configured as part of one or more pumps, wherein each pump comprises three diaphragm valves in series and comprising an input valve, a displacement valve, and an outlet valve, wherein each diaphragm valve is actuated by a different pneumatic channel and the three diaphragm valves are independently activated in a sequence designed to move fluid through the pump.

8. (Previously Presented) The microfluidic structure of claim 7, wherein one or more of the pumps is used to form a multi-directional fluidic router, said router comprising one central displacement valve in fluid communication with one or more input valves and one or more outlet valves.

9. (Previously Presented) The microfluidic structure of claim 7 configured as a mixer, wherein the input valves and output valves of the pump are each connected to admission channels to form a mixer wherein mixing is accomplished by actuating the three diaphragms in a sequence to pump the fluid in a loop or back and forth.

10. (Canceled)

11. (Previously Presented) The microfluidic structure of claim 1 wherein the pneumatic layer comprises a pneumatic channel comprising a displacement chamber wherein deflection of the membrane forms a fluid reservoir in the fluidic channel.

12. (Original) The microfluidic structure of claim 11, wherein mixing is accomplished by moving a fluid between two reservoirs.

13. (Previously Presented) The microfluidic structure of claim 11, wherein reservoirs in each of a plurality of the fluidic channels are connected by a fluidic bus.

14. (Original) The microfluidic structure of claim 11, wherein the reservoir has one or more inputs and is operable as a reactor.

15-44. (Canceled)

45. (Previously Presented) The microfluidic structure of claim 1 wherein one pneumatic channel actuates a plurality of diaphragm valves that control fluid flow in a plurality of different fluidic channels.

46. (Previously Presented) The microfluidic structure of claim 1 wherein different pneumatic channels each actuate a diaphragm valve that controls fluid flow in different fluidic channels.

47. (Previously Presented) The microfluidic structure of claim 1, wherein the first and second layers are plastic.

48. (Previously Presented) The microfluidic structure of claim 1 wherein the membrane is PDMS.

49. (Previously Presented) The microfluidic structure of claim 1 wherein the pneumatic layer further comprises one or more pneumatic ports to supply vacuum to the pneumatic channel.